

**ARIZONA GAME AND FISH DEPARTMENT
HERITAGE DATA MANAGEMENT SYSTEM**

Animal Abstract

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CLASSIFICATION, NOMENCLATURE, DESCRIPTION, RANGE

NAME: *Eleutherodactylus augusti cactorum*

COMMON NAME: Western Barking Frog

SYNONYMS: *Craugastor augusti cactorum*, *Craugastor augusti* (Dugès In Brocchi, 1879), *Eleutherodactylus cactorum*, *Hylactophryne augusti cactorum*

FAMILY: Anura: Leptodactylidae

AUTHOR, PLACE OF PUBLICATION: Taylor, Univ. Kansas Sci. Bull. 25(17): 391. "1938" 1939.

TYPE LOCALITY: 20 miles northwest of Tehuacán, Mexico.

TYPE SPECIMEN: HT: F-100021. E.H. Taylor and H.M. Smith 6383, adult female collected 30 August 1936.

TAXONOMIC UNIQUENESS: *Eleutherodactylus augusti cactorum* is 1 of 4 subspecies of *Eleutherodactylus augusti* currently recognized, and the only one that occurs in Arizona. The other three subspecies that occur outside of Arizona include *E. a. latrans* (New Mexico and Texas), *E. a. augusti*, and *E. a. fuscofemora*. *E. a. cactorum* is quite similar to *E. a. augusti* in size and pigmentation, however the tympanum diameter to head width ratio is usually smaller in *E. a. cactorum* (Zweifel 1956, Zweifel 1967). Recent measurements in Arizona confirmed the small tympanum size (Goldberg and Schwalbe 2000). *E. a. cactorum* is the smallest of the subspecies in body length (Zweifel 1956). Differences in call structure, coloration, and mtDNA sequences strongly suggest that barking frogs in Arizona are reproductively isolated from those in New Mexico and Texas. The results indicate that either northern populations are connected via gene flow through southern Mexico (i.e., they are subspecies as currently recognized), or they represent independent lineages as originally described (i.e., western barking frogs, *E. cactorum* in Arizona, and the eastern barking frogs, *E. latrans* in New Mexico and Texas). Discrimination between these hypotheses awaits analysis of barking frog populations in Mexico. (Goldberg et al. 2004; also cited in NatureServe 2006).

DESCRIPTION: Adults are olive to gray-green to light brown with dark spots, often with light edges, dorsally. Juveniles have a prominent light band that darkens with age across the center of their backs. Their eyes are large and dark brown (Stebbins 1985, Schwalbe 1990). Males have dark tympana and during the breeding season, have dark throats, which become mottled in late summer. Females have white throats and pink tympana throughout the year (Goldberg and Schwalbe 2000). The snout-vent length for the species ranges from 5.0-9.5 cm (2.0-3.8 in) (Stebbins 1985). At Coronado National Memorial in Arizona, the mean size of females was 8.0 cm, while males were 7.2 cm (Goldberg and Schwalbe 2000). The frogs

have a broad head and short legs, which gives them a squat, toad-like appearance. They have smooth skin and slender, unwebbed toes with prominent tubercles beneath the joints. Although they can make hops from boulder to boulder, they frequently walk in a stilted fashion with their hindquarters and heels off the ground. There is a fold of skin across the back of the head and a circular fold on the belly. Their tympana are semitransparent and smooth (Stebbins 1985, Schwalbe 1990).

AIDS TO IDENTIFICATION: The fold of skin on the back of the head and circular fold on the belly, along with the tubercles on the feet, distinguish this species from other Arizona anurans. The distinctive call sounds like a series of small dog barks in 2-3 second intervals in New Mexico and Texas (Zweifel 1967, Stebbins 1985) or in Arizona the croak of a raven (Schwalbe 1997). The juvenile color pattern of a light band across the center of their dark backs is distinctive, but has not been observed in Arizona. The subspecies *E. a. cactorum* can be distinguished from the other subspecies by their smaller tympana (Zweifel 1956, Goldberg and Schwalbe 2000). The tympana diameter/head width ratio is usually less than 0.17 (Zweifel 1956).

ILLUSTRATIONS: Color drawing (Behler and King 1979: p. 154)
Black and white photo (Bezy et al. 1966: fig. 1, p. 223)
Black and white drawing (Stebbins 1985: pl. 12)
Color drawing (Conant 1975: pl. 45)
Color photo (Schwalbe 1990)
Black and white photo (Zweifel 1956)
Color photos of frog and habitat (Randall Babb, in Wismann 2001)
Color photos (Erik F. Enderson, in <http://www.arts.arizona.edu/herp/ELAU.html>, accessed 2006)
Color photos (Cecil Schwalbe, in <http://www.arts.arizona.edu/herp/ELAU.html>, accessed 2006)
Color photo (Randy Babb, in AZ PARC 2006 <http://www.reptilesfaz.com/Turtle-Amphibs-Subpages/h-e-augusti.html>)
Color photo (Tom Brennan, in AZ PARC 2006 <http://www.reptilesfaz.com/Turtle-Amphibs-Subpages/h-e-augusti.html>)
Color photo (Suzanne L. Collins, 2004, in CNAH at <http://www.naherpetology.org/detail.asp?id=1098>)

TOTAL RANGE: Southern Arizona (Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito Mts.) and northeastern Sonora (Sierra El Tigre) south along the Pacific Coast foothills of Western Mexico.

RANGE WITHIN ARIZONA: Cochise and extreme southern Pima and Santa Cruz counties, including Quinlan, Santa Rita, Patagonia, Huachuca, and Pajarito Mts. Unconfirmed report (Wright and Wright 1949) from Sierra Ancha in Gila County, but probably a mis-id.

SPECIES BIOLOGY AND POPULATION TRENDS

BIOLOGY: These secretive frogs are terrestrial and are found in areas with limestone and other rock outcrops. The frog is nocturnal, spending the day under rocks, or in mines, wells, caves, or fissures (Stebbins 1985, Schwalbe 1990, Goldberg and Schwalbe 2000). When threatened, it inflates to several times its normal size. The skin fold on the belly may be useful in helping it to cling to the sides of caves. There is little life history information available. The longest documented lifespan of a wild individual is 5 years as an adult (Goldberg and Schwalbe unpublished data).

Advertisement calls of frogs from Arizona were significantly longer in duration, higher in frequency, and had longer duration pulses than those of frogs from either New Mexico or Texas; frogs from these later two sites were indistinguishable in these call variables (Goldberg et al. 2004). Their call is ventriloquistic, making them difficult to locate even after they are detected; most are located by their distinctive and loud “Walk-walk” or “Whaa-whaa-whaa-whaa” call. In Arizona, they call from their hiding spots (e.g. crevices) for only two to four weeks on rainy nights after the start of the summer monsoons in late June or July. Frogs call dependably for only two or three nights following the first heavy monsoon storm of the season (Rorabaugh, in AZ PARC 2006).

REPRODUCTION: Males begin calling with the onset of the summer monsoon season. The large-yolked, unpigmented eggs are laid in moist or rain-filled cracks, fissures, and in caves on land (Stebbins 1985; Wright and Wright 1949 cited in Goldberg 2003). Clutches contain from 50-76 eggs (Goldberg, accessed 2006). There is possible parental care of the eggs by the female (Goldberg and Schwalbe 2000, but see Jameson 1950); however, the male is probably the parent that guards them. There is evidence that the male keeps the eggs moist with fluids from his body (Wismann 2001). The young undergo direct development within the egg and hatch as small frogs in approximately one month (Stebbins 1985, Schwalbe 1990, Schwalbe 1997), unlike other frogs and toads in Arizona who have an aquatic larval stage. Frogs hatch in about 25 to 35 days (Schwalbe 1990). Anecdotal evidence from Arizona suggests that one clutch may have hatched in 21 days (Goldberg and Schwalbe, cited in Goldberg, accessed 2006).

FOOD HABITS: The diet consists of a variety of invertebrates. Scat analyses and observations of the population inhabiting Coronado National Memorial have yielded the following prey items: field crickets (*Acheta assimilis*), scorpions (*Vaejovis* sp.), silverfish (*Lepisma* spp.), centipedes (*Scolopendra* spp.), kissing bugs (*Triatoma* spp.), short-horned grasshoppers (Acrididae), spiders, ant lions (*Hesperoleon niger*), and longhorned katydids (Tettiganiidae) (Schwalbe 1990, Schwalbe 1997, Goldberg and Schwalbe 2000).

HABITAT: In Arizona, western barking frogs are found on limestone, rhyolite, granite, and perhaps other rock outcrops on the hillsides of canyons within Madrean evergreen woodlands and woodland-grassland ecotones. It is strongly associated with Naco Group limestone in the Huachuca Mountains. (Bezy et al. 1966, Goldberg and Schwalbe 2000, Schwalbe 1990). Permanent water is not necessary.

ELEVATION: 4,200 – 6,200 feet (1280-1890 m). At Coronado National Memorial in Arizona, individuals were caught from 5,250 - 6,200 ft. (1600 - 1890 m) (Goldberg and Schwalbe 2000).

PLANT COMMUNITY: In Arizona, the western barking frog is found within Madrean evergreen woodlands (Bezy et al. 1966, Goldberg and Schwalbe 2000). The species has been found in yucca-covered hills, brushy woodlands, open pine forests, juniper-live oak woodland, and low dense clumps of cactus (Stebbins 1985).

POPULATION TRENDS: Little is known about populations in Arizona. At Coronado National Memorial the populations seems to be small, yet the survival rate quite high. Because the populations are estimated to be so small, stochastic events threaten their persistence (Goldberg and Schwalbe 2000).

SPECIES PROTECTION AND CONSERVATION

ENDANGERED SPECIES ACT STATUS:	None
STATE STATUS:	WSC (AGFD, WSCA in prep) [State Endangered AGFD, TNW 1988]
OTHER STATUS:	Forest Service Sensitive (USDA, FS Region 3 1999) LC at full species level (Santos-Barrera 2004, <i>In</i> IUCN 2006)

MANAGEMENT FACTORS: In order to gain insight into the location and size of populations, call counts should be performed in areas with rocky outcrops during the first two weeks of the summer monsoon season. There is a very small window of opportunity to detect these frogs and visual encounter surveys are inappropriate for this species. Monitoring sites should then be established so that managers can uncover population trends. Damage to habitat patches may heavily impact the survival of this species. In southern Arizona, rocky areas between 5000 and 7000 ft., especially with southeasterly slopes, should not be developed until they have been surveyed for barking frogs at the appropriate time of year (Goldberg and Schwalbe 2000).

PROTECTIVE MEASURES TAKEN: In Arizona, an Arizona fishing license is required to collect amphibians. Arizona Game and Fish Commission Order 41 allows for the collection and possession of 10 individuals of this species per year.

SUGGESTED PROJECTS: Research into population dynamics is needed, along with information on life history, distribution, population sizes, and population trends.

LAND MANAGEMENT/OWNERSHIP: NPS – Coronado National Monument; USFS – Coronado National Forest; Private.

SOURCES OF FURTHER INFORMATION

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ADDITIONAL INFORMATION:

The specific name *augusti* is in honor of the 19th century French herpetologist August Duméril. Taylor collected the subspecies type specimen in a cactus patch, thus *cactorum*. The trinomial was first used by Zweifel 1956 (Zweifel 1967). The frogs can be difficult to find when following the sound of their call and have been called ventriloquists by many (Wright and Wright 1949, Bezy et al. 1966, Schwalbe 1990).

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